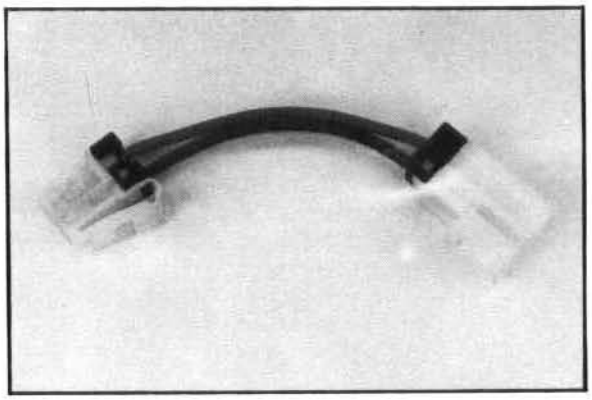
Power Up Testing - Late Type II, 1993 to Current 500's

1. Check battery voltage using digital fluke meter. Must read 12.2 or higher. It voltage OK? No→ Yes↓	Charge, service, and test battery; or replace battery. Continue testing if needed. See battery service.
2. Check voltage to ECU R/GN Pin #106. Should be 12.2 or higher. Is voltage OK? No→ Yes↓	Check circuit from battery through circuit breaker and to ECU. Repair and/or replace faulty wiring or components. Continue to step 3.
3. Check voltage to ECU O/BK wire Pin #11. Should be 12.2 volts while engine is being turned over. Is voltage OK? No→ Yes↓ See Also Block 5	Check for signal from battery charge coil to ACS G - GW wires. Is signal OK? Repair circuit if necessary. No - See Block 4 Yes↓
4. Check battery charge coil and connecting wires. Replace coil and/or repair wires. Continue tests.	Check for voltage from battery to ACS. Is circuit OK? Repair circuit if needed. Yes↓
	Replace ACS. Is system now OK? No↓
	Replace ECU and retest.
5. Check self-shut-off relay and circuit, OK? No→ Yes↓	Repair relay circuit. Note: Non-resistor caps may affect ECU operation.
6. Replace ECU and retest.	

Fuse Link

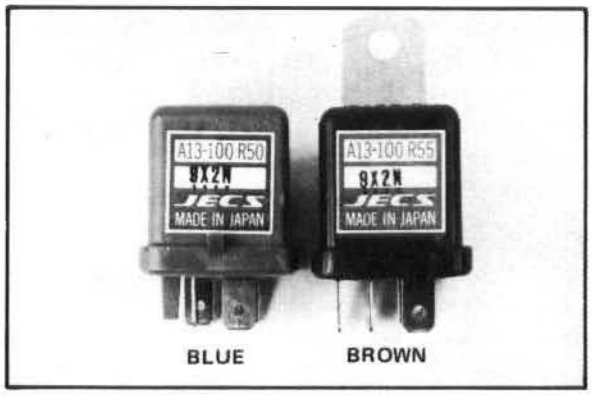
The fuse link is the circuit protection device in Type I and 1991-1992 Type II electrical system. Should a system overload such as a dead short occur, the fuse wire will open the circuit preventing further damage. If this link should open, find and correct the problem and then replace the fuse link. Never attempt to replace the fuse link with a conventional fuse. Use only an OEM fuse link.

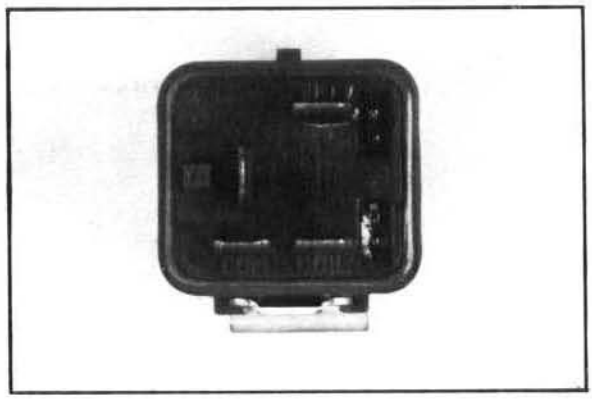


Service of the fuse link is limited to verification of whether or not the wire is continuous. Remove fuse link from machine and use an ohmmeter to determine resistance value of wire between plugs. Resistance values of less than .5 ohms indicate a good wire. Values greater than that will necessitate link replacement. Current models will use a self setting circuit breaker.

Relay Coils

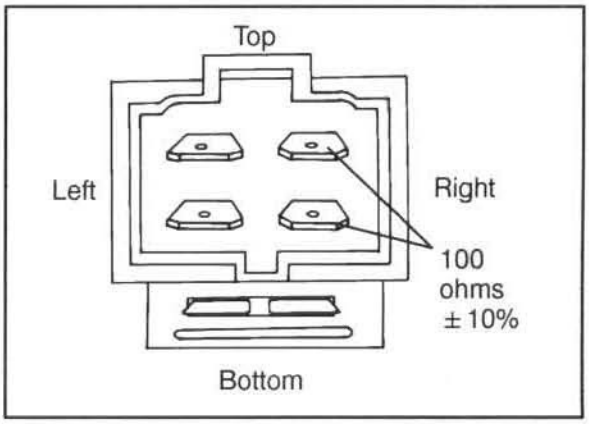
The system relay coils are mounted on the front side of the right footrest assembly on Type I and 1991-1992 Type II systems. The relays for later model Type II systems are mounted on the ECU. Their function is to control a major current carrying circuit with a smaller, low current carrying control circuit. When the ECU or ignition switch closes the low current coil circuit within the relay, the magnetism in the coil closes the contact points, allowing current to pass through the relay and power up to the ECU, fuel pump, etc. Both system types incorporate two blue relays, one controlling the fuel pump and the other the self shut-off time delay relay. The Type I system also uses a brown relay to control the main power input to the ECU. On 1993 and later model Type II systems, the relays are black.





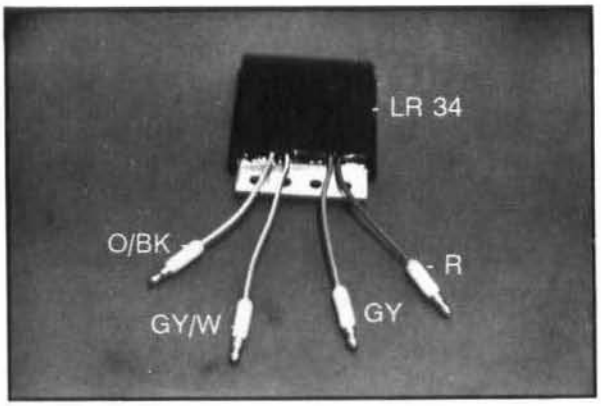
Service to relays is limited to measuring pull-in coil resistance and measuring volt drop across contacts. The coil resistance should be between 65 and 70 ohms measured between the two pins marked coil on relay base. When relay is energized, volt drop across relay contacts should be less than .1vDC, measured in parallel with relay. On the bench, the relay can be checked by hooking the marked relay coil terminals to a 12v battery and checking resistance of relay contacts. The resistance must be less than .2 ohms.

1993 and later Type II style EFI relays are tested by placing 12 volts to contact left side as shown in the diagram to the right. Measuring volt drop across contacts .1vDC. Measure resistance of right side contact. This should be 100 ohms ± 10%.



ENGINE ELECTRICAL
Alternator Controlled Switch "ACS"

Shown is the (ACS) for the 1993 to current 500 EFI systems. The ACS controls voltage from the alternator by rectifying from AC to DC voltage current to charge the battery. It also supplies the ECU with a 12vDC battery voltage signal to indicate that the engine's crankshaft is turning. The ACS eliminates the need for the "Ready" light system reset as used on previous 500 EFI models. **NOTE:** Even if the key switch and kill switch are in the "off" position, the ACS will power up the system if the crankshaft is turned. (See also page 4.40, Power up testing.)



Test Procedure

With ignition in the on or run position, crank engine over slowly. You will hear the fuel pump run for approximately five seconds. This tells you the ACS is working. If the fuel pump doesn't work when cranking, disconnect ECU wire harness and reconnect to reset ECU. Crank engine again. If fuel pump won't start working, unplug the harness at the ECU and check Orange/Black wire PIN #11 on the ECU harness. Battery voltage should be present when cranking engine. **NOTE:** You can also use the select monitor to determine if the ECU is getting power. If the select monitor display lights up, then the ECU is getting power, check the ACS wire at the ECU plug. **CAUTION:** Take care not to distort the pin with your tester lead. If no voltage is present, reset ECU and check Orange/Black lead at ACS unit. If no voltage is present, check for alternator output or loose connections. If alternator output is OK, replace ACS. Note:The ACS switch must also cut out battery voltage to ECU when engine is not running. A voltage reading at the O/Blk wire will cause battery to drain.

NOTE: 1994 to current 500's will use a five wire ACS LR36. The extra wire is for a center tap alternator.

Cold Starting

Whenever the engine is being cold started, the ECU will select a special "start-up" mode. This will occur any time the engine is being cold started; for example, any Type I system which has been "key off" long enough for the self shut-off timer to power down the system, or a Type II system which has had the engine stopped long enough for the ready light to go off. After turning on the ignition key to reset the system, the fuel pump will run from three to five seconds to pressurize the system. When the ECU sees the first ignition pulse it provides a longer than normal "prime" pulse to the injectors to inject enough fuel into the engine for starting. On 1993 and later Type II systems, there is no ready light or ignition key reset. The pump may or may not run for the 3-5 second period depending on how long the engine has been off. In all systems, the "prime" pulse only occurs if the pump runs for the 3-5 second period.

Once the engine is running the ECU provides a rich cold engine mixture while the engine is warming up. It uses the engine temperature sensors as an indicator of when the engine is warm enough to start decreasing the fuel to air ratio. If the key is turned off, the ECU provides power to the self shut-off relay for from ten seconds to ten minutes, depending upon the system type, and will not repeat the fuel system pressurizing and prime pulse during that time. Once the self shut-off sequence has expired, the engine will have had sufficient time to cool and the ECU will again repeat the cold start sequence.

In Type I systems only, during times of severely hard running or in very warm weather if the engine crankcase should approach a temperature which might result in engine damage the ECU will provide additional fuel to the engine for cooling. When the crankcase temperature sensor indicates a temperature of approximately 100°C, the ECU will lengthen the pulse time and cause an over-rich condition which will cool the engine. As soon as the engine temperature returns to normal, the ECU will return to the original map.

If the engine should become flooded during starting, it can be cleaned out by holding the throttle wide open while turning the engine over. If the engine is not running, and the throttle is open more than 60°, no fuel will be injected. The engine will start and will begin receiving fuel from injection when the engine exceeds 800 RPM, or when the throttle position goes under 60°. The engine should then clean out and run normally.

In Type II systems, the engine is protected against overheating by the engine coolant sensor. If the engine coolant reaches a threshold (85°C 1993 and later, else 100°C) the "temp" light on the dash will begin to flash. If the engine coolant temperature continues to increase, the light will begin to blink faster. When the light blinks fast, the ECU adds fuel to enrich the mixture and to help prevent engine damage. The fuel will continue to be added until the light stops blinking.